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Occupational health REVIEW

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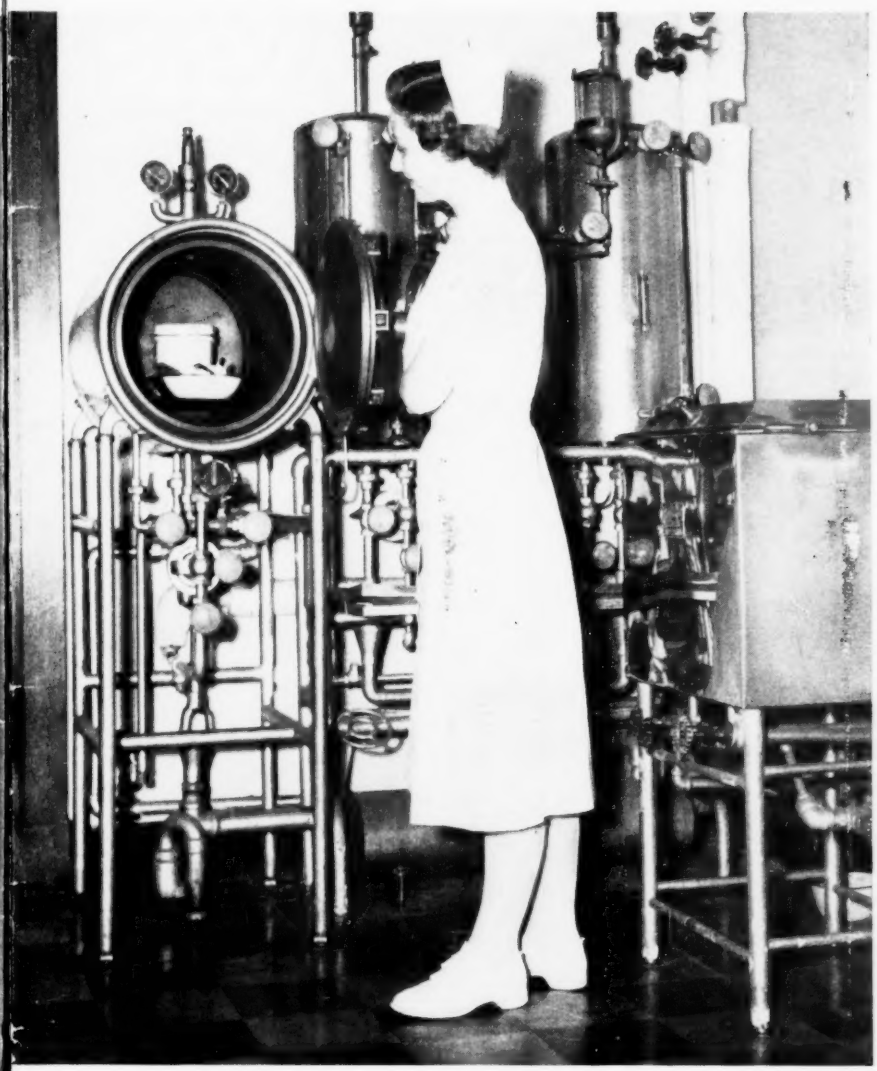

Occupational Health Division

DEPARTMENT OF NATIONAL HEALTH AND WELFARE • OTTAWA

JANUARY, 1956

OCCUPATIONAL HEALTH REVIEW

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COVER PLATE

The cover plate illustrating the principle of adequate sterilization equipment in a health centre is through the courtesy of the Division of Industrial Hygiene of the Quebec Department of Health.

An Effective Health Service Programme

The following material was prepared by the Quebec Division of Industrial Hygiene for distribution at their display in conjunction with an Exhibition called "Quebec Week" held for ten days in the Show Mart in Montreal, March 1955. We feel that this material is very well prepared and presented and should prove very useful to employers, nurses, medical officers and anyone else interested in health services, particularly occupational health. The material is printed with the permission of Dr. F. J. Tourangeau, Director, Division of Industrial Hygiene, Ministry of Health, Montreal, Quebec.

How Does an Effective Health Service Program Pay?

1. It helps to improve worker efficiency and productivity.
2. It helps to raise morale among employees giving evidence that management has a sincere interest in its employees and their welfare.
3. It helps to reduce accident and insurance costs.
4. It helps to reduce absenteeism (surveys have shown as much as 29%).
5. It helps to reduce labor turnover (surveys have shown as much as 27%).
6. It helps to reduce occupational diseases (surveys have shown as much as 63%).
7. It improves the quality of the working force by attracting a higher caliber of personnel.
8. It adds another important channel of communication with employees through the benefit of the trained observation powers of professional men and women of high integrity.
9. It raises the standard of the organization in the eye of public opinion.

How Much Does It Cost?

The cost of Industrial Health Service varies from $10.00 to $30.00 per employee per year, according to the number of employees, type of industry, hazards, size of department and scope of services. Following is the per capita cost of three typical industries in the Montreal area for the year 1954.

Industry	Number of Employees	Cost per emp per year	Health Centre		Number and type of personnel			
					Physicians			
			Rooms	Floor space	Full time	Part time	Nurses	Others
Company A....	250-300	$20.80	3	465 sq. ft.	..	2	1	0
Company B....	450	$20-$30	4	600 sq. ft.	..	1	1	0
Company C....	7000	$17-$18	17	4800 sq. ft.	2	5	10	6

Company A also operates a cafeteria for its employees and absorbed a cost of $59.32 per employee for the year—a very generous contribution towards health promotion.

The cost of setting up an Industrial Health Service depends upon the facilities available and the amount of reconstruction or new building required. It could vary from $500.00 to $3000.00 The present cost to equip a five room unit is approximately $1,500.00. These costs are quickly off-set when one considers what disability means in losses to both consumers and the public. Less goods may be produced because of accidents and illness to workers, which means higher prices or fewer satisfactions in goods and services to the consumer. Public services may be interrupted through absence by disabled workers. Public burdens arise from persons unable to work, resulting in dependency which will require public assistance through philanthropic contributions or taxes.

Where can one obtain Information or Assistance Regarding Industrial Health Services?

The Industrial Hygiene Division of the Ministry of Health of the Province of Quebec, 1570 St. Hubert Street, Montreal, gives guidance and assistance regarding health problems of industrial workers. Through

a staff of physicians, chemists, engineers, physicists, medical technologists, laboratory technicians, a librarian and an Industrial Nursing Consultant, this Department offers the following services:

Preliminary surveys of industrial establishments for determination of hazards.

Technical studies of potential health hazards.

Laboratory and field analyses of environmental materials.

Promotion of industrial hygiene education facilities.

Investigation of suspected or reported occupational diseases.

Distribution of health education materials.

Co-ordination of activities of other official and voluntary agencies for improvement of the health of industrial workers.

Staff participation in teaching industrial hygiene.

Analysis of clinical materials.

Provision of consultant services regarding establishment or improvement of plant nursing services, including access to qualified nursing personnel.

Provision of consultant services regarding establishment or improvement of plant medical programs.

Information and assistance in plant medical services is also available from the Industrial Medical Association of the Province of Quebec.

NEW DEVELOPMENT IN MEDICAL SERVICES

David Brunet, M.D.
Woodlands Medical Service
Consolidated Paper Corporation Limited

Due to the widespread nature of the Consolidated Paper Corporation's forestry operations, employees of Woodlands Division of the Company have had to forego, in the past, most of the health service benefits provided routinely to employees in the Mill Divisions.

Before discussing the present status of the Woodlands health programme, a few historical facts in this connection should be presented. Between 1930 and 1934, surveillance of Woodlands hospitals, first-aid men, and eligible employees was carried out directly by the Company's Medical Director, Dr. H. S. Hooper, who visited outlying areas annually. From 1934 to 1947 however, Woodlands health organization was somewhat loose and local but, in 1947, the Corporation set up a Safety and Training Department, with accident prevention, and first-aid treatment of bush injuries as its primary aims. Depot hospitals, and first-aid men in charge of them were under direct control of this new Department. But this did not solve the problem of providing annual physical examinations for all eligible permanent and continuous service personnel and, in 1953, local physicians were asked to carry out this health survey; the survey revealed that eligible Company personnel in more distant depots were still not being covered so, in 1954, a medical officer was appointed to the Company medical organization to work expressly with the Woodlands Division.

The Woodlands Medical Officer works very closely with the Safety and Training Department which has the following specific functions:—

1. The establishment and maintenance of hospitals in Woodlands Depots;

2. The hiring and training of first aid men; at the present time, approximately 50% of the first aid men are graduates of the Course for Male Nurses at the Hotel Dieu de St. Vallier Hospital, at Chicoutimi;

3. Instruction of first aid men and other Company employees (particularly clerks who will be employed in jobbers' camps) in St. John Ambulance Corps methods;

4. The provision of Safety and Hygiene Inspectors to supervise the work of first aid men, and to check camp organizations, cook house facilities, etc., from the point of view of hygiene and sanitation.

5. The teaching of safe working methods to forestry workers by Woods Instructors, and the showing of safety films emphasizing accident prevention;

6. The development of enthusiasm among jobbers and sub-contractors in the Accident Prevention Programme. This is effected by

(a) annual conferences with jobbers

(b) payment of bonuses to jobbers, on a graduated scale, proportionate to the number of accident-free working days

(c) awarding of prizes to individuals in accident-free camps

(d) the placing of posters in camps, provision of brochures on safe handling of dynamite, the awarding of certificates to safe drivers, and so on.

The First Aid man in each Depot is in charge of handling bush injuries, which he is usually the first to see medically, although some cases may first be seen by clerks in jobber camps. He is responsible for the smooth functioning of his Depot hospital, and the use and maintenance of drugs and supplies provided. It is his job to treat minor injuries, and to get such cases back to work as quickly as possible. With major injuries, or anything beyond his scope, he must arrange safe transportation for the patient to the nearest location where qualified medical help is available. The Company designates doctors in various locations, close to Depots where possible, to handle Company bush injuries.

The services of the Woodlands Medical Officer have been integrated with the basic Safety and Training Programme for the following purposes:

1. To carry out annual physical examinations of eligible personnel, which places Woodlands' employees

on a somewhat similar basis to employees in Mill Divisions.

2. To evaluate the work of First Aid personnel from a medical point of view, to give encouragement and advice in the treatment of difficult cases, and to keep a periodic check on Depot hospitals.

3. To maintain rapport with local, Company-designated doctors in the various districts.

4. To carry out qualifying examinations of employees who have taken St. John Ambulance courses provided by the Safety and Training Department.

Since the inauguration of the Woodlands medical programme in September 1954, all but one of the 10 Depots have been visited once, and one area has been revisited. During this time, 244 physical examinations, with urinalyses, have been carried out. This number includes the annual re-examination of cooks. Beyond the usual occasional disabilities such as hernia, hypertension and obesity, a few interesting cases have come to light, for example: (a) a case of severe recurrent thyrotoxicosis, now undergoing radioactive iodine treatment in Montreal; (b) one case of a pituitary adiposogenital syndrome, referred to Montreal for endocrinological help; (c) four cases of rheumatic heart disease: (d) one case of gynecomastia. All disabilities uncovered are discussed immediately with the patients, who are then referred to local physicians or, where necessary, to the appropriate specialist for treatment.

Depots in which medical examinations are carried out are located at Peribonka, about 170 miles north of Roberval; Nikauba, about 140 miles north-west of Roberval; Casey, 80 miles northwest of La Tuque and Les Escoumains and Portneuf, respectively, 150 and 175 miles north-west of Quebec City, on the north shore of the St. Lawrence River.

Employees examined are classified physically according to the system employed in Company Mill Divisions.

In addition to this medical survey, 28 employees have been examined this year for St. John Ambulance Corps certificates and medallions.

An interesting feature of the Woodlands medical service is the annual Woodlands First Aid Conference, held in one of the Depots. This is organized by the staff of the Safety and Training Department, and First Aid men from all Depots attend. The latter are encouraged to discuss problems which have arisen during the preceding cutting season, and to present papers on various aspects of their work. The Medical Officer attends, and is expected to offer constructive criticism on the handling of difficult medical problems, and the use of drugs and equipment provided in Depot hospitals. The first-aid men are very enthusiastic, and the conference helps to maintain morale and promote esprit de corps; it gives these men an opportunity to know that the contribution they make in handling injuries in the bush, often more than 100 miles from the nearest competent medical authority, is understood and appreciated.

It is anticipated that as the Woodlands Medical Programme develops, additional health services may be practically feasible. For example, a large proportion of employees have been screened in mobile chest X-ray clinics, and it is expected that eventually, all Woodlands employees will receive this service.

Environmental Control & Occupational Health

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Hon. Secretary, the British Occupational Hygiene Society

Today it is becoming more widely recognized that the older meaning of the word "health", implying wholeness or soundness rather than mere absence of disease, is valuable in directing our efforts in the field of public health. This is, perhaps, especially true in occupational health where the well-being, or otherwise, of the worker will be reflected in his productivity and efficiency. An earlier Chadwick lecturer, Professor Fair of Harvard, has pointed out that the maintenance of health and well-being depends mainly on two professions: the medical profession "for repairing damage caused by unfavourable environmental conditions and for fitting man to his environment"; and the engineering profession "for controlling unfavourable environmental conditions and fitting the environment to man". Both the points of view implied are valid and valuable, and, until an environmental "millenium" is reached, both must be concurrently applied.

Professor Macdonald has said "that environment is the ultimate cause of at least nine tenths of the diseases from which we suffer". "It is only in the most primitive societies that environment can be called natural; in all others it is our artificial product and overwhelmingly the product of the engineer". This is almost platitudinous in reference to the worker's invironment, clearly the product of applied science. We shall consider in this lecture, as illustrations of particular aspects of environmental control:

1. Warmth, comfort and working efficiency;
2. Silicosis and dust control; and
3. Control of lead-poisoning.

Each of these topics will suggest various lessons that we must learn if we are to maintain, at its peak, the health and well-being of the worker. Teamwork is essential and will be discussed finally.

The factors affecting thermal comfort are:—

I. air temperature
II. humidity
III. air velocity; and
IV. radiation from surroundings.

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The difficulty of specifying conditions of thermal comfort is aggravated by the need to take account of these four parameters. Many attempts have been made to combine these factors into a single index, examples of which are the Kata-thermometer, Effective Temperature, Equivalent Temperature and the Globe Thermometer. The Effective Temperature index based on air temperature, air velocity and humidity, is generally accepted in the U.S.A.

Acute effects of heat

The acute effects of heat include heat cramps, heat stroke and heat exhaustion. They are suffered chiefly by boiler stokers, foundry-men, steel-workers and miners.

Chronic effects of heat are more important than the acute effects and are shown by increased morbidity and mortality and by lower efficiency of working. In the very hot and heavy industries the incidence of, and mortality due to, respiratory diseases is very high.

Working efficiency is materially affected by heat and cold. For example, as may be imagined, manual dexterity falls off as temperature drops. In addition, it has been shown that at air temperatures above 100° F. (effective temperature about 90° F) mental efficiency declines rapidly. This is of particular importance in the Royal Navy where various skilled tasks have to be carried out in very uncomfortable conditions.

Heat and Safety

Nor is this all; temperature has an influence on the frequency of industrial accidents. At temperatures between 65° and 70° F the frequency is lowest and increases quite rapidly as the temperature rises or falls.

Control of abnormal air conditions

In this brief survey we have seen that the thermal conditions of the worker's environment govern his comfort, and may affect adversely his health, his physical and mental efficiency, and his accident-proneness. Thus far, the physician, the physiologist and the physicist have been concerned in appraising the worker and his environment. It is now the time for the engineer to

enter the discussion as he it is who must control the environment. Three general approaches are available to him in this, as in most procedures for environmental control:

1. Change or mechanization of the process.
2. Local control of the atmosphere surrounding the process.
3. Control of the general atmosphere in the workplace by ventilation or air-conditioning.

Such control is usually technically possible but may not always be economically feasible. Where, for any reason, they cannot be applied it becomes necessary to apply preventive medical methods to the worker. But this should be regarded as a last measure; we ought to aim for adequate environmental control.

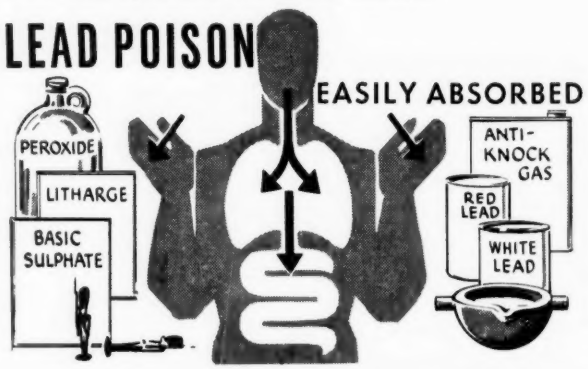
Industrial air-conditioning today is mainly concerned with maintaining the temperature, humidity and cleanliness of the air at standards suitable for some industrial process; air-conditioning for the health and comfort of the workers is still not common. In hot and heavy occupations it will usually be found impossible to provide general cooling either by ventilation or refrigeration and spot-cooling of the workers may be necessary. Such local cooling is physiologically difficult and may, in turn, cause discomfort. The basic essential in all abnormal thermal conditions is to avoid a too rapid cooling, which appears to be mainly responsible for the chronic effects.

Silicosis

That those working in high concentrations of siliceous dusts are particularly likely to suffer from pulmonary disorders has been known for a long time. Efforts to reduce the concentration of such dusts have greatly reduced the morbidity and mortality from silicosis. At the same time, workers in many countries have been investigating the precise mode of action of silica in producing the nodular pulmonary damage characteristic of this disease.

There is a rough correlation between the amount of silica yielded into solution by various siliceous materials and their apparent pathogencity when introduced into the lungs of animals.

In order to reduce the danger of coal-dust explosions in coal mines, stone-dusting of the walls, roof and floor has been practised for many years. In spite of the increase of siliceous material in the air, the stone-dusting has reduced the prevalence of silicosis. Some of the mineral silicates, e.g. Kaolin and mica, are particularly insoluble in body fluids and appear to depress the solubility of any free silica present with them. Admixtures of stone dust with powdered quartz or flint depress the solubility from 14 mg. of silica per 100 ml. for quartz alone down to about 1 mg. for the mixture. Small amounts of aluminium or aluminium hydroxide in the stone dust go into solution and form a thin deposit of aluminium hydroxide on the surface of the silica particle. The presence of as little as 0.1% of aluminium powder in quartz dust reduces its solubility from 14.0 to 0.2 mg. SiO_2/100 ml. Attempts have been made, therefore, to prevent and check the development of silocosis by the daily administration of aluminium or aluminium hydroxide which was inhaled.



The size of the dust particle has a material effect on its pathogenicity, on its ease of suspension in the air, on the readiness with which it penetrates the lung, and on other factors, For man, it appears that particles below 5 microns in diameter are responsible for this lung disease; and this appears to be a function of the total surface of the silica exposed to the tissues.

Dust Control

To a certain extent acclimatization to heat is possible but, attempts to prevent silicosis by medical means are not successful. It is, therefore, essential to control the dust or to protect the worker from the dust where its abatement is not feasible. Three approaches to the problem are possible and are listed here in order of decreasing satisfactoriness:—

1. Elimination of the sources of dust.
2. Prevention of dust dispersion.
3. Individual protection of the worker.

The most effective way of eliminating dust sources is to alter the dust-producing process either so that no dust is created or so that any dust produced is not harmful. Examples of such changes are:—

(a) replacement of sandstone wheels by grinding wheels of artificial abrasives containing no free silica, e.g., carborundum (SiC) or fused alumina;

(b) substitution of shot-blasting for sand-blasting in fettling castings; in this case it is necessary to ensure that the castings are quite free from the moulding sand before shot-blasting;

(c) partial replacement, in granite-cutting, of the surfacing machine by steel-shot saws which operate under a water jet.

Dispersion of the dust may be prevented by enclosing the process, by wetting the dust or by local exhaust ventilation. An example of the first method is the use of sand-blasting for monumental lettering, the work being totally enclosed and the operator controlling it from outside the enclosure. Analogous to this is segregation of the dusty work and worker from jobs producing less dust. In these circumstances personal protection is necessary for a smaller number of workers. For example, shot-blasting is normally carried out in an enclosure, the operator being fitted with a hose mask.

For over 200 years, in Britain, water has been used for laying the dust in potteries. In more recent years it has been used in mines. (Where the mines are hot this has the very undesirable effect of greatly increasing the humidity, so that, while mortality and morbidity due to pneumoconioses may be reduced, that due to respiratory diseases may be increased). To be effective in controlling dust two things are essential: the dust must be wettable and the dust-laden water must be efficiently removed so as to prevent re-dispersion upon evaporation of the water. Wetting of the particles is frequently assisted by the use of a wetting agent. A very fine water spray may not be effective, since the droplets produced are very small and may evaporate during their slow settlement, to leave the dust, once again, suspended in the air. Although wetting the dust may reduce the relative dustiness materially, the total dust may still remain too high; it is not a panacea.

In certain processes where the dust-producing source is more or less stationary the dust may be efficiently removed by local suction. It must be emphasized that correct design is essential. Operating costs are fairly high and good maintenance of equipment is most necessary.

As a last resort, where it is not possible to eliminate dust or to prevent its dispersion, the worker must be provided with respiratory protective equipment. Two criteria must be fulfilled: it must be effective for its purpose and it must be worn continuously. It is the latter factor which makes it so unpopular and, in its frequent rejection by workers, it cannot be regarded as a satisfactory first line of defence against dusts. For low dust concentrations simple filter dust-masks are valuable and are relatively comfortable in wear. They can be fairly efficient but, for this, they must be a good fit to the wearer's face. For very high dust concentrations, e.g. in sand or shot-blasting, the operator must be supplied with air from outside the dusty zone. This can be done by means of a hose-mask which fits over the head or by means of a heavy suit which is supplied with air by a hose.

Industrial Lead Poisoning

Modern industrial processes require the worker to use, or to have contact with, many toxic substances. Some of these are acutely toxic, producing their ill-effects rapidly; examples are arsine, carbon monoxide and the cyanides. Many are chronically toxic, producing their characteristic damage after longer periods of exposure; examples are lead, organic solvents, and chromium. A number of these poisonous materials can cause either chronic or acute intoxication; an example is beryllium. Indeed, lead can cause acute intoxication—for example, in children who have ingested lead from lead paint or lead toys—but in modern industry its effect is usually chronic. The danger of these chronic toxic agents is that their effect may be produced after so long an exposure that control of the hazard is of no avail to the victim. Their control, therefore, is vitally important to the long-term well-being of the worker. At the same time it is often difficult to assess the effectiveness of this control owing to the delay in the onset of symptoms in the affected worker. As an example of this important group of chronic intoxicants we may here consider lead-poisoning.

The toxic effect of lead has been recognized for more than 2,000 years. Lead has been described as a great imitator and, certainly, the early symptoms may appear vague to the inexperienced. These include weariness and irritability, followed by headache, sleeplessness and loss of appetite. More characteristic symptoms are constipation and colic, and finally there may be paralysis, especially wrist-drop. Less severe intoxication, without any clear clinical manifestations, may nevertheless, result in a chronic state of sub-health. Mental symptoms may be found, though this is now unusual.

The use of lead, or of lead compounds or products, is astonishingly widespread in industry. The compounds of lead which are important in industry are: the monoxide; the higher oxides, litharge, red lead, peroxide etc.; white lead, the basic carbonate; the basic sulphate; and a number of other salts. In addition, of course, the use of molten lead or lead-containing solders might produce a fume of the monoxide. Tetraethyl lead, used in some anti-knock petrols, is parti-

cularly dangerous since it can be absorbed through the skin as well as by ingestion and inhalation.

Ease of absorption is the vital point in most industrial poisonings, and is certainly so in the particular one under discussion. Physical properties such as wettability, particle size, tendency to clumping of particles, and the size of these aggregates are the properties which are more important when considering industrial plumbism than is mere solubility. This is so because, to be damaging, a poisonous substance must be absorbed, and must, therefore, be in a physical state that is readily absorbed. Of the three possible portals of entry—the skin, the gastro-intestinal tract and the lungs —the most important is the lungs. Lead compounds inhaled as fume or dust are rapidly absorbed from the lungs and enter the circulation directly. Some of the solid matter inhaled in this way may eventually be swallowed but entry to the systemic circulation from the gut is to a large extent prevented by the liver. Other methods of ingestion can, for the most part, be prevented by personal hygiene and by the Factory Regulations which forbid chewing, smoking or eating in places where lead is worked.

It will readily be appreciated that engineering control measures must depend on objective quantitative determinations. In general these are of two types:

1. measurements of airborne lead;
2. measurements of lead absorbed by the worker.

These measurements, which perhaps we may term environmental and biological respectively, must in turn, be related to clinical observations by the industrial physician. An early attempt to specify atmospheric contamination was that of Legge who in 1909 set a limit of 0.5 mg. per cu.m., at which level paralysis and mental damage would never occur and colic only occasionally. At the same time he laid down that the lowest daily dose which inhaled as dust or fume, would cause chronic lead-poisoning is 2 mg. Now the dose received by any worker in a lead-laden atmosphere clearly depends on the amount of lead in the air and on the time spent in that atmosphere. It also depends on the amount retained in the lungs by the worker. This, in turn, depends on the volume of air breathed and on the percentage retained. It has been shown that with low concentrations such as are found in industry, 16% of the lead entering the lung is retained in shallow breathing, but that on deeper breathing, produced by gentle exercise, the retention is 33%. For bench work the minute-volume is 12 litres, while with moderately heavy work the minute-volume is increased to 21 litres. This means that harder work causes more lead-bearing air to enter the lungs and relatively more lead to be retained in the lungs, so that the total retention is greatly increased. These facts are very relevant in connexion with medical control of lead workers. As a result it is now generally agreed that airborne lead should be limited to 0.15 mg. per cu.m. The estimation of airborne lead is not easy owing to the hydrophobic nature of many forms of lead and lead compounds, but satisfactory methods are now available.

Medical Control of Lead-Workers

The "medical" control of lead-workers may conveniently be considered in three stages:—

1. pre-employment examination;
2. conditions of employment; and
3. medical observation of the worker at risk.

Women and young people are excluded from work involving serious lead hazards. Although doubts have been expressed about the necessity for excluding women, this can be justified on at least two grounds: The known abortifacient effect of lead, and the fact that even in moderate work the women will be worked relatively harder than men at the same task and so retain more lead. Some people are especially susceptible to plumbism; a family history taken at the pre-employment examination may make it possible to exclude some of these especially susceptible men.

Frequent examination by the industrial physician will ensure that early physical signs and symptoms of lead intoxication are noticed. A valuable physical sign is the blue line of lead sulphide formed near the margin of gums of men whose oral hygiene is poor. The physician is assisted in his clinical diagnosis by a number of methods of biological assay. The two methods of choice for routine control are lead in urine and the count for stippled red-cells showing punctate basophilia. Both tests can be interpreted to establish a norm for that individual. As group tests they are especially valuable. Lane's "standards" are:—

I. *Lead in urine*
   mean 0.125 mg. per litre
   occasionally 0.20 mg. per litre
   rarely 0.23 mg. per litre
II. *Punctate basophilia*
   stippled cells per million red cells—3000

The punctate count should be accompanied by an estimation of total haemoglobin and the size of the granules should be observed also. The stippled-cell count for a group is a specific and fairly sensitive indication of changes of environmental lead and may be regarded as an essential adjunct to any air measurements made. Workmen should not be allowed back to work in a heavy lead hazard after a serious infectious illness.

The two essentials of lead control are good housekeeping in the plant and dust control. Most processes involving the production of lead dust or fume can, and should, be hooded and provided with local exhaust ventilation. Where large amounts of dust or fume are produced, e.g. in ore-roasting in smelting, the exhausted dust-laden air should be filtered. This is usually car-

ried out by means of woollen filter bags—wool is especially suitable as it is resistant to the sulphur compounds also produced by the roasting; the lead recovered in this way is a valuable amount.

Face masks should be provided to those workers who have to be in high concentrations of lead dust or fume. If possible, however, their use should not be relied on as personal protection is notoriously neglected. Mechanization is highly desirable since it not only reduces the number of men at risk but also reduces the physical exertion required by these men and, hence, their lead intake.

The effectiveness of the environmental measures must be continually assessed by estimations of airborne lead. The lead may be collected by a paper filter or by an electrostatic precipitator and will be estimated chemically.

Cooperation in Occupational Hygiene

In reviews of this kind it is usual to state a thesis and then to illustrate it. In this paper the illustrations are given first so that the underlying principles may be seen to be self-evident. It seems to the author that a basic essential, still inadequately appreciated, for the maintenance of a worker's health and well-being is the fruitful cooperation between the medical man, the pure scientist and the applied scientist. All three must work together in a team for the best results.

In the first section on temperature and comfort we saw the need for the engineer to control the atmospheric conditions that the physiologist and physicist have measured, while the physician and the medical statistician can assess the effectiveness of this control in terms of individual response. In connexion with siliceous dusts we saw that engineering control was particularly important since symptoms do not appear until irreversible pathological changes have occurred. In this case the effectiveness of the engineering control must be assessed by physical measurements of airborne dust; the medical scientist is here especially concerned with research into the aetiology of silicosis so that the control measures can be intelligently designed. Finally, the control of industrial plumbism shows, in its clearest form, the need for the smooth functioning of a team: the chemist measuring airborne lead and lead in urine, the physician, carrying out his pre-employment and routine examinations, and looking for blood changes, and the engineer keeping down the airborne lead.

Perhaps we may conclude by quoting a physician and an engineer. The doctor said: "We can at least write the prescription; the dispensing of that prescription is in the hands of the engineer, the other important member of the industrial health team." The engineer wrote: "It cannot be too strongly emphasized that, whatever the method of control and whatever the limit of reduction of contaminant, the final test of the effectiveness of a control method is the effect which the process has on the people working about it".

Acknowledgments

The author wishes to acknowledge his especial indebtedness to Dr. Thomas Bedford for active encouragement and helpful criticism; and for information to Dr. Bedford, Professor R. E. Lane and Professor E. J. King.

Information from the American Industrial Hygiene Association

Major significant development in the field of controlling occupational health hazards in industry comes with an announcement by the American Industrial Hygiene Association of a new group of informative bulletins called HYGIENIC GUIDE SERIES.

Concerned with common industrial materials which present occupational health hazards through toxicity, acute and chronic irritation, the current series summarizes the latest authoritative and substantiated information on:

Aniline	Sulfur Dioxide
Benzene	Hydrogen Sulfide
Formaldehyde	Butyl Alcohol (N-Butanol)
Amyl Acetate	Cadmium
Acetaldehyde	Carbon Tetrachloride

These and subsequent Guides will be made available to industry and other interested persons.

Each Hygienic Guide, which will be prepared by leading governmental, medical and professional authorities on its subject, will include information on the following:

1. Maximum allowable concentration for both short and long term exposures.
2. Significant chemical and physical properties.
3. Major uses.
4. Evaluation of exposures.
5. Engineering control procedures.
6. Medical control procedures.
7. References to the literature.

Developed through the Hygienic Guides Committee of the AIHA, these Guides which bring together all of the pertinent information required for occupational injury hazard evaluation are planned to cover a wide range of the common industrial chemicals and materials. Equally authoritative Guides will be prepared on such topics as new chemicals as they are introduced to the industrial market, radiation hazards, noise, and air pollution control.

(Continued inside back cover)

Sherman M. Williamson, M.D., Assistant Medical Director, Boeing Airplane Company, Seattle, Washington.

It is the responsibility of the Industrial Physician to protect the individual employee from hearing loss that is the result of exposure to industrial noise.

In order for the Industrial Physician to protect the employee from noises, he must evaluate his plant to see if a noise problem exists. He must make himself aware of the type of noise involved. Is it a constant rumbling of general factory noise or are there sharp peaks of loud noise? Is the loud noise continuous or is it interrupted? Are there sudden impacts that cause the noise? Of what intensity is the noise?

The part that the acoustical engineer can play in noise evaluation is very important. He can determine the noise level and the type of noise in areas that the industrial physician feels are critical. If the survey shows that certain areas or individual operations are in a high noise category, then means must be found either to reduce the noise level or protect the workers.

The engineer must determine if it is feasible to treat acoustically the area involved.

He must also determine if it would be possible to treat a noisy machine to decrease the noise at its source. Acoustic treatment may solve the noise problem. If not, the industrial physician then must advise on the type of personal protective equipment to be used.

In the aircraft industry it is often impossible to screen the noise at the source; therefore, some means must be found to protect the individual worker. Basically, a personal protective device must give attenuation to the point where the noise (sound pressure level) does not cause damage. This protection must be for both high and low frequencies. In our experience there are three main groups to consider in affording personal protection:

(a) Those in the riveting and production areas.
(b) Those in the hammer shops.
(c) Those working with jet engines.

There are other smaller groups in experimental work as in the wind tunnel and the armament section that have noise exposure.

Riveting and Production (includes saw operators, spindel shapers, etc.)—The noise in such areas may be of a fairly constant nature, with peaks in the immediate vicinity of an operator. Not only the riveter himself but the buckers and mechanics working in the same area are exposed. Ear plugs offer adequate protection in these areas if they are worn, but the average worker will not wear the ear plugs continuously unless he is forced to do so. Ear plugs must be fitted to the individual if protection is to be effective.

Hammer Shops—Noise for a hammer operator is greatest at the time of impact of the hammer, but with a large battery of these machines, the over-all noise level is rather constant. In general, the old time hammer operator may consider it a badge of his trade to be somewhat hard of hearing, so will not wear any protective devices except under protest.

Jet Engines—This is the area of the highest noise (sound pressure) levels and where no acceptable protective device is available. All available commercial types have been tested but do not protect adequately against jet noise at full power. The sound pressure level about the J57 jet engine is 130–140 decibels at 100% power. With afterburner attached to the J57, levels of 160 decibels are recorded. All protective devices whether plugs, muffs, etc. give a rather good degree of attenuation for the high frequencies. With earplugs plus helmet-muff (the best practical protection yet available), hearing loss may still occur in some persons exposed to 130 to 140 decibels.

It is obvious, therefore, that with the higher levels now attained with afterburners, hearing protection device development is even more important.

Selection of the type of personal protective device must be based on the type of noise exposure. Educating the worker to the use of protective devices is the first step in a plant program. The foreman must be educated first; it is obvious that a program will fail if a foreman tells his subordinates he has been in noise for years and still hears well. The average employee will not wear ear plugs unless he is forced to do so. Busy foremen cannot be expected to patrol noisy areas looking in ears for an earplug that is almost invisible. The physician can't be too enthusiastic about enforcing the constant wearing of a device which can be uncomfortable or even painful, which can cause sensitization, or which cannot be worn in the presence of a draining middle ear. Management is concerned that an unpopular edict on enforced wearing of plugs may create

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poor employee relations. Nevertheless, hearing protection must be afforded.

Within our Company a NOISE ABATEMENT COMMITTEE has been appointed to study the noise problem and to make recommendations to Management. Physicians are committee members. One of the funtions of the committee is the study of the community noise problems. A curfew on the hours of engine runs has been a temporary solution. Studies have led to the following recommendations in order to offer protion to the worker:

(a) Limit the noise exposure time of flight mechanics working on jet engines.

(b) Reduce engine-run time to a minimum. By studying engine-run requirements, Boeing experience indicates that exposure time can be cut significantly.

(c) Rotate the flight mechanics so that exposure to jet noise is not confined to a few workers. This allows more time for the ears to recover from a single noise exposure.

(d) Limit the number of mechanics that are actually required to conduct the tests by (1) use of portable sound attenuation booths for observers and fire-bottle handlers, by (2) development of remote-control engine-trim devices.

Let us consider the personal protective device itself. The most discouraging factor in protection against noise is the lack of acceptable protective devices.

(a) *The Earplug*—An earplug should be smooth, have no abrasive action on the external canal, be non-sensitizing, lend itself to easy cleaning and be as comfortable as possible. They must be fitted to the individual by a trained technician. At present we are using the V-51-R type earplug and find it perhaps the most widely accepted. Some waxed cotton plugs are used to fit the variant ear canal.

(b) *Muffs*—They should fit snugly to the head and be free of projections which can catch on machinery and structures. They must clean easily and not cause undue pressure symptoms or perspiration at contact points.

(c) *Helmets*—The firm type of helmet (similar to a football or crash helmet, is rather cumbersome, expensive, warm and hard to get on and off. The helmets do reduce the sound energy transmitted to the bones of the head. The face should be covered if the helmet is to give maximum effectiveness. There are also the soft cloth helmets, containing various types of muffs, that are more comfortable and do an adequate job of attenuation if noise levels are moderate.

The combination of earplugs and a helmet give more protection than either alone, and must be used to protect against intimate exposure to jet noise.

After the industrial physician has determined the need for noise protection and set up a personal protective program, then he must discover whether or not the adopted measures are effective. By audiometric findings, he will be able to determine the efficiency of the protective devices. It is necessary that audiograms be performed prior to initial noise exposure and then repeated at intervals determined by the findings and the level of the noise exposure. Remember always that one must evaluate any hearing loss by taking into consideration the history and previous noise exposure of each person in a noisy area. Don't blame the hearing loss of the ex-artillery man or naval gun captain, the skeet instructor or dynamite blaster, to the noise in your plant. Careful pre-employment and periodic audiograms will soon detect progressive hearing loss and thereby assist in revealing the effectiveness of your protective devices. The audiograms will reveal whether or not earplugs are being worn even in more moderate noise level areas. The fact that one can determine this from valid audiograms alone puts pressure on the employees to comply with plant regulations on the wearing of plugs.

The results of the use of personal protective devices at Boeing Airplane Company can be summarized as follows:

(a) *Earplugs*—The V-51-R plug gives good protection for the high frequency in our riveting areas. The attenuation is poor in the lower frequencies. We obtained attenuation of 35 decibels at frequencies above 2000, and 5-8 decibels at low frequencies. Periodic audiograms on the riveting group do not show loss if earplugs are worn.

(b) *Muffs*—They give good attenuation at high frequency but poor protection at low frequencies. They are quite expensive in comparison with earplugs for the slight extra protection they afford.

(c) *Helmets and Muff Combination*—Gives about the same protection as do the muffs. Some studies by the Aero-Medical Laboratory on the attenuation afforded by earplugs have recorded attenuation of 26 decibels in the frequencies up to 1000 and then increasing to 40 and 50 decibels attenuation in the higher frequencies. Our experience has shown that in actual practice this attenuation is unobtainable. We find that 5-8-10 decibel attenuation at frequencies below 2000 is the maximum obtainable in actual practice. With the higher levels now and to be attained by jet engines, it is vital that more research must be done to develop adequate noise protective devices.

Morbidity Records & Statistics for Industry*

Division of Industrial Hygiene,
Ontario Department of Health, Toronto, Ont.

The record forms used in medical departments and health centres in Industry are of two basic types, those designed primarily for clinical reference and those used for summary or statistical purposes. The former type, the individual clinical record or case card such as those prepared for the Compensation Board or for the use of carriers of disability insurance, for various reasons cannot readily be used to provide a summary of sickness and accident among employees. To provide regular or periodic grouped statistical data covering the medical experience of all employees as a unit, a special type of recording system is required.

An impressive case can be made for the desirability of a summary of total morbidity wherever medical or nursing service is provided in industry; such industrial populations offer supervised units of the adult population for which data on sickness and accident may be collected and assessed without undue cost or effort. In order that such statistical data may be comparable from one industry to another, uniform methods of recording and tabulating are essential. To this end serious effort is currently being made by the Ontario Department of Health to provide guidance for industrial medical personnel in the collection of information and the use of standard summary-type medical records. This effort is focussing attention on the use of acceptable medical terms, the establishment of uniform definitions, and the application of standard methods for recording and tabulating the essential data. Although some industries require quite detailed medical records, it is not necessary for the summary or statistical source records to be either extensive or complex. Data of great value can be produced if four requirements are met:

1. Uniform definitions of terms and rates.

2. Separation in the recording and summarizing of (a) lost-time morbidity and (b) visits to the health centre (each divided by sex).

3. Division of lost-time morbidity, and of conditions reported to the health centre, by class-division (i.e. non-occupational sickness, occupational sickness, non-occupational accident, occupational accident).

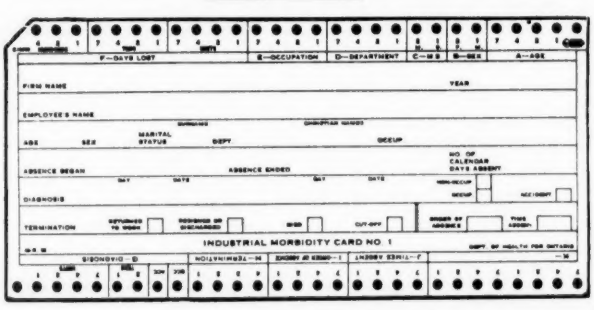
4. A count of the average number of persons employed, by sex.

After several preliminary trials, four systems have been devised for the procurement of morbidity data for the use of medical personnel in Industry. The requirements and facilities of industries vary so much that it was desirable to provide three alternative systems for the recording of lost-time morbidity; the fourth system deals with visits to the health centre. Choice of one or the other of the three absence recording systems depends on such factors as number of employees, amount of detail desired, and availability to the Company of mechanical tabulation equipment.

The first system is referred to as a "Marginal-Punch" system, and requires that a Keysort card be prepared for each morbidity absence. The second is referred to as a "Dual-Purpose" system, and requires that a mechanically-punched card be prepared for each morbidity absence. The third is referred to as a "Hand-Tabulation" system, and requires that a record card be prepared for each employee who has one or more morbidity absences during the year.

The fourth system, describing visits to the health

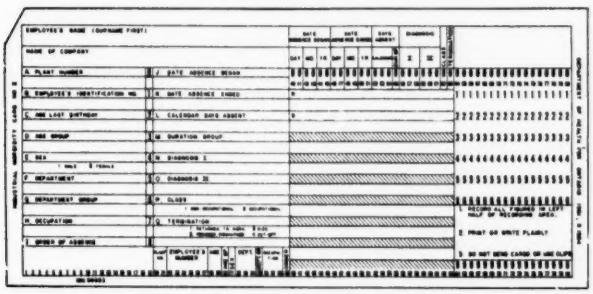
THE MARGINAL PUNCH CARD



*A summary of a series of four brochures dealing with Industrial Records, prepared by the Ontario Division of Industrial Hygiene.

centre, requires the use of three forms. The first is a day sheet on which all visits made during the day are recorded, and totalled, under specific headings. The second is a monthly sheet on to which are posted the

THE DUAL-PURPOSE PUNCH CARD



daily totals; such a form also serves as a yearly sheet on to which are posted the monthly totals. The third is a periodic report form which will present a periodic summary of the work of the health centre.

The four systems have in common certain definitions, as well as provision for a breakdown of the mor-

APPENDIX C

HAND-TABULATION WORK SHEET

LOST TIME FROM SICKNESS AND ACCIDENT BY SEX, DIVISION, AND CLASS

(Number of Male Employees Who Were Absent -
(Number of Female Employees Who Were Absent -

ABSENCES	MALES				FEMALES			
	Sickness		Accident		Sickness		Accident	
	Non-Occupational	Occupational	Non-Occupational	Occupational	Non-Occupational	Occupational	Non-Occupational	Occupational
	1	2	3	4	5	6	7	8
5								
10								
15								
20								
25								
30								
35								
40								
45								
50								
Days Lost								
Absences								
TOTALS	Number of Absences -				Number of Absences -			
	Number of Days Lost -				Number of Days Lost -			

bidity experience by sex and by class-division. Explanatory brochures have been prepared for each system; certain essential points connected with the records described therein are reviewed in the following paragraphs.

APPENDIX I

PERIODIC REPORT OF HEALTH CENTRE - A

Company _____

Location _____ Month or Year _____

INFORMATION	Males	Females	Total
1. Average number of employees for the month (or year)			
2. Total visits to Health Centre (A and B)			
3. Average number of visits per employee per month (or year)			
4. Average number of visits for same month last year			
5. Conditions Reported			
Total visits for conditions reported (C to H)			
All visits for repeat conditions reported (C and D)			
All new conditions reported (E to H)			
New occupational sicknesses (E)			
New non-occupational sicknesses (F)			
New occupational accidents (G)			
New non-occupational accidents (H)			
6. Interviews			
Total (Personal and family problems) (26 and 27)			
With Plant Physician (26)			
With Nurse (27)			
7. Physical Examinations			
Total examinations (28 to 35)			
Initial (28 and 29)			
Routine periodic (regular intervals) (30 and 31)			
Special (Request, transfer, occupational, exposure, etc. (32 & 33)			
(34 & 35)			
8. Miscellaneous Services			
Total miscellaneous services (36 to 47)			
Immunization			
X-ray			
Blood test			
Tuberculin test			
Other laboratory tests			
Surgical treatments			
Physiotherapy			
9. Referral of Visits (48 to 51)			
To family physician (48)			
To dentist (49)			
To specialist (50)			
To health or other community agency (51)			
10. Not Returned to Job (52)			
11. Seen by Plant Physician (53)			
12. Home Visits			
13. Other Activities (Such as articles in Company paper, lectures, inspections, first aid classes, etc.)			

Figures in parenthesis refer to columns on Form 603-R54. DHO/54

In the three absence systems, a morbidity absence is the loss of one or more full days due to sickness or accident; the duration of absence is counted in full calendar days. Absences which begin with a calendar year are counted, and the days lost by these absences up to March 31st of the following year, at which time any "hold-over" absences are terminated.

An opportunity for achieving an acceptable method of classifying the causes of morbidity was provided with the publication by W.H.O. in 1948, of the International Statistical Classification of Diseases, Injuries, and Causes of Death. This classification contains the first internationally accepted list of diseases and injuries, and from it a grouping of nineteen causes of

Appendix F

COMPANY _____ **DAILY VISITS TO HEALTH CENTRE** LOCATION _____

PAGE _____ DATE _____

NUMBER	TIME	DEPARTMENT	ALL VISITS M	ALL VISITS F	NAME	ALL VISITS FOR REPEAT CONDITIONS REPORTED D	ALL VISITS FOR REPEAT CONDITIONS REPORTED N	NEW OCCUPATIONAL AND NON-OCCUPATIONAL CONDITIONS REPORTED: ALL NEW SICKNESSES REPORTED D	ALL NEW SICKNESSES REPORTED N	ALL NEW ACCIDENTS REPORTED D	ALL NEW ACCIDENTS REPORTED N	SITE OF INJURY AND/OR TREATMENT	SERVICES RENDERED: INTERVIEWS WITH PLANT PHYSICIAN 26	INTERVIEWS WITH NURSE 27	PHYSICAL EXAMINATIONS: INITIAL M 28	INITIAL F 29	ROUTINE PERIODIC M 30	ROUTINE PERIODIC F 31	SPECIAL M 32	SPECIAL F 33	MISCELLANEOUS SERVICES: IMMUNIZATION M 34	IMMUNIZATION F 35	X-RAY 36	BLOOD TEST 37	T.B. TEST 38	OTHER LAB. TESTS 39	SURGICAL TREATMENT 40	PHYSIOTHERAPY 41	REFERRAL: TO FAMILY PHYSICIAN 42	TO DENTIST 43	TO SPECIALIST 44	TO HEALTH OR COMM. AGENCY 45	NOT RETURNED TO JOB 46	SEEN BY PLANT PHYSICIAN 47	NUMBER
1	8.30	Stores	1		Jones John		1					Burn back R hand. Redressing																								1
2	8.40	Staff	1		Smith James				1			Stye. Eyes Gen. Hy		1																						2
3	8.45	Ground	1		Williamson Fred					1		Ex heat stroke. Re Ex. to work							1														1	1	1		3
4	9.00	Office	1		Brown Mary				1		1	Backache, Hy gr + Sunburn. Nausea																										4
5	9.15	Fab. Shop	1	1	2	1		1		1		Dermatitis, Repeat physio. Examined Ex. down. Minor Comp. Ex. splinter R hand																				2					1	5
6																																						6
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TOTALS			A	B		C	D	E	F	G	H		26	27	M 28	F 29	M 30	F 31	M 32	F 33	M 34	F 35	36	37	38	39	40	41	42	43	44	45	46	47		

602—454

ILLUSTRATION OF THE USE OF THIS FORM - EXPLANATION OF PROCEDURE

No. 1. - Visited the health centre for the re-dressing of a non-occupational burn, which he had first reported on a previous day. Entries are made in column A, column D, identification in Site/Treatment column.

2. - Reported a new non-occupational condition of the eye. Besides attending to the stye, the nurse also spent some time in counselling re diet. Entries are made in column A, column F and column 6, column 27.

3. - Reported for the treatment of a new occupational condition - heat-stroke. He was seen by the doctor, and sent to the hospital. Entries are made in column A, column G and column 18, columns 53, 52, 51.

4. - Reported two conditions during one visit: a new non-occupational sickness-- backache, and a new non-occupational sickness - sunburn. Entries are made in column B, column F and 17, column H and 18.

5. - Visited the health centre three times during the day. On his first visit he reported a new occupational dermatitis, and had physiotherapy treatment for a non-occupational synovitis reported previously. Entries are made in column A, columns E and 14, columns D and 42. Later in the day he reported a new accident - occupational splinter. Entries are made in column A (raise to 2), columns G and 22. He made a third visit; the splinter wound was re-dressed, he was given another physiotherapy treatment, and was seen by the plant physician. Entries are made in column A (raise to 3), column C, columns D and 42 (both raised to 2), column 53. Note entries in Site/Treatment column.

Appendix G

COMPANY _____ MONTHLY/YEARLY SUMMARY OF VISITS TO HEALTH CENTRE LOCATION _____

| MONTH | DAY | ALL VISITS M | ALL VISITS F | MONTH YEAR | ALL VISITS FOR REPEAT CONDITIONS REPORTED O | ALL VISITS FOR REPEAT CONDITIONS REPORTED N | NEW OCCUPATIONAL AND NON-OCCUPATIONAL CONDITIONS REPORTED: ALL NEW SICKNESSES REPORTED O | ALL NEW SICKNESSES REPORTED N | ALL NEW ACCIDENTS REPORTED O | ALL NEW ACCIDENTS REPORTED N | 1 Infective and Parasitic | 2 Neoplasms | 3 Allergic, Endocrine, Etc | 4 Blood | 5 Mental, Psychoneurotic, Etc | 6 Nervous Syst. and Sense Org. | 7 Circulatory System | 8 Acute Upper Resp. Infect. | 9 Other Resp. Diseases | 10 Diseases of Digestive Syst. | 11 Menstrual Disorders | 12 Other G.U. System | 13 Complications of Pregnancy | 14 Diseases of the Skin | 15 Bones and Organs of Movement | 16 Congenital Malformations | 17 Symptoms and Ill-Defined | 18 Effects of Poisons, Weather, Etc. | 19 Fractures and Dislocation | 20 Sprains and Strains | 21 Lacer., Cont. and Punct. Wounds | 22 Superficial Injuries, Contusions | 23 F.B. and Other Eye Injury | 24 Burns | 25 Other Accidents and Violence | INTERVIEWS: With Plant Physician | INTERVIEWS: With Nurse | PHYSICAL EXAMINATIONS: Initial M | Initial F | Routine Periodic M | Routine Periodic F | Special M | Special F | MISCELLANEOUS SERVICES: Immunization | X-Ray | Blood Test | T.B. Test | Other Lab Tests | Surgical Treatment | Physiotherapy | REFERRAL: To Family Physician | To Dentist | To Specialist | To Health or Comm. Agency | Not Returned to Job | Seen by Plant Physician | DAY |
|---|---|---

morbidity, based on its section headings, has been prepared; this grouping provides a useful tool for summarizing types of morbidity, both in the measurement of absences and of visits to the health centre. These nineteen Diagnosis Groups are used in the first and second absence systems. In addition, a fresh approach is involved in the use of these groups for the recording of conditions reported to the health centre, one which allows new conditions reported to be compared directly with reasons for absence collected according to the first two absence systems. The first 17 Diagnosis Groups constitute the "disease" component of the International Statistical Classification; the 18th and 19th Diagnosis Groups constitute the "injury" section of this classification. Through custom and long usage, Industry desires to include occupational Effects of Poisons, and Effects of Weather, etc. (e.g. caisson disease, heat exhaustion) with those conditions that are occupational diseases; this is accomplished by adding the eighteenth group to the first 17 groups and designating the combination as "Sickness". What remains of the "injury" section—i.e. the 19th Diagnosis Group—is termed "Accident". Thus, without seriously disturbing the arrangement of the International Statistical Classification, Industry is provided with the grouping they desire under the headings Sickness and Accident.

The annual experience is presented in standard tables as the number and per cent of absences and days lost, by age group, order of absence, duration group, department group, diagnosis group, and by class-division. The following three important morbidity indices may be obtained:

Frequency rate—Annual number of absences per 100 employees.

Disability rate—Annual number of days lost per employee.

Severity rate—Average number of days lost per absence.

Similarly, the visits to the health centre are tabulated under several headings for conditions reported and for services rendered, and the annual number of visits per employee may be obtained for comparative purposes.

Book Review

THE DISEASES OF OCCUPATION: By Donald Hunter, M.D., F.R.C.P.

There is so much that could be written regarding this book that it is extremely difficult to convey the pleasure derived from reading it in the space at our disposal. It was opened one evening to glance at the contents page but it was three hours later before it was reluctantly closed. From the first page it fascinates the reader by the wealth of description, the odd little pieces of information not usually found in text books, and by the intensely human approach and undertaking.

The first part is historical and traces the development of industry from earliest times, correlating this with the social, economic, and health problems of the worker. The picture painted of the Industrial Revolution and its effect on the life of the ordinary family in England will not be readily forgotten by the reader. Quotations from Charles Dickens are used with effect and add to the impact of this description of the horrors of the period. Although some one hundred pages are devoted to the history and the growth of legislation to mitigate the evils, they are well used for they bring out vividly the importance of the "job" in everyday family life, not only to the wage earner and his health, but to the social and spiritual life of the entire family. If the reader were to read no further than these opening chapters he would, despite the modesty of the author regarding them, gain a deeper realization of the necessity for full human understanding of the worker.

In Chapter five the "Ancient Metals" are dealt with and in Chapter six the "Other Metals". Here we are taken by the author to Greece and Rome, view the statues of Michelangelo, thence to the Taj Mahal, and finally back to the Marble Arch. It is easy reading and intensely interesting and it comes as a surprise to realize just how much solid matter one had learned with so little effort, and how wide a field has been covered for even the recently introduced organic phosphorus insecticides are included.

Of particular interest to Canadian readers is Chapter six in which Nickel is dealt with in detail, and the history of the Mond process given with that little additional personal touch which characterizes the entire book. The chapters on the aromatic carbon compounds, the aliphatic carbon compounds, and the noxious gases, while becoming more chemically detailed, are handled in the same interesting manner and are rich in information for medical men in industry.

The remaining chapters on diseases and accidents maintain the same high standard. Throughout there are full details of signs, symptoms and pathology, and these with the case histories and illustrations, provide the reader with a comprehensive view of the diseases dealt with. In addition each chapter has its own bibliography for reference.

(Continued inside back cover)

Information from the American Industrial Hygiene Association

(Continued from page 9)

Present plans are to publish five of these Guides in each issue of the Association's Quarterly. They will also be made available in single sheet reprint form. The Guides in this form can be punched and kept in notebooks for easy reference.

Hygienic Guide sheets may be obtained from the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION, 14125 Prevost, Detroit 27, Michigan, at 25 cents each. All orders for less than $2.00 must be prepaid. Twenty per cent discount is allowed on orders of five or more Guides. Forty per cent discount is allowed on orders of 100 or more.

Book Review

(Continued from page 16)

Throughout the book we were intrigued by finding the origin of words to which we had previously given little thought. It is of interest to know that Cobalt comes from Kobold meaning a goblin. A goblin was believed to be responsible for the noxious fumes in the smelting of smaltite. The "goblin" was Cobalt. Nickel comes from "Old Nick" who was also credited with causing difficulties.

In "The Diseases of Occupations" Dr. Hunter has not only provided a text book filled with valuable information but has presented this in a fashion and style which makes the reading a real pleasure.

A word of praise must be given to the publishers for the quality of paper, binding, and print, and for the excellent illustrations.

The book is available from English Universities Press, Ltd., 102 Newgate Street, London, E.C.1., England and the price is 5 pounds 5 shillings, about 16 dollars in Canadian currency.

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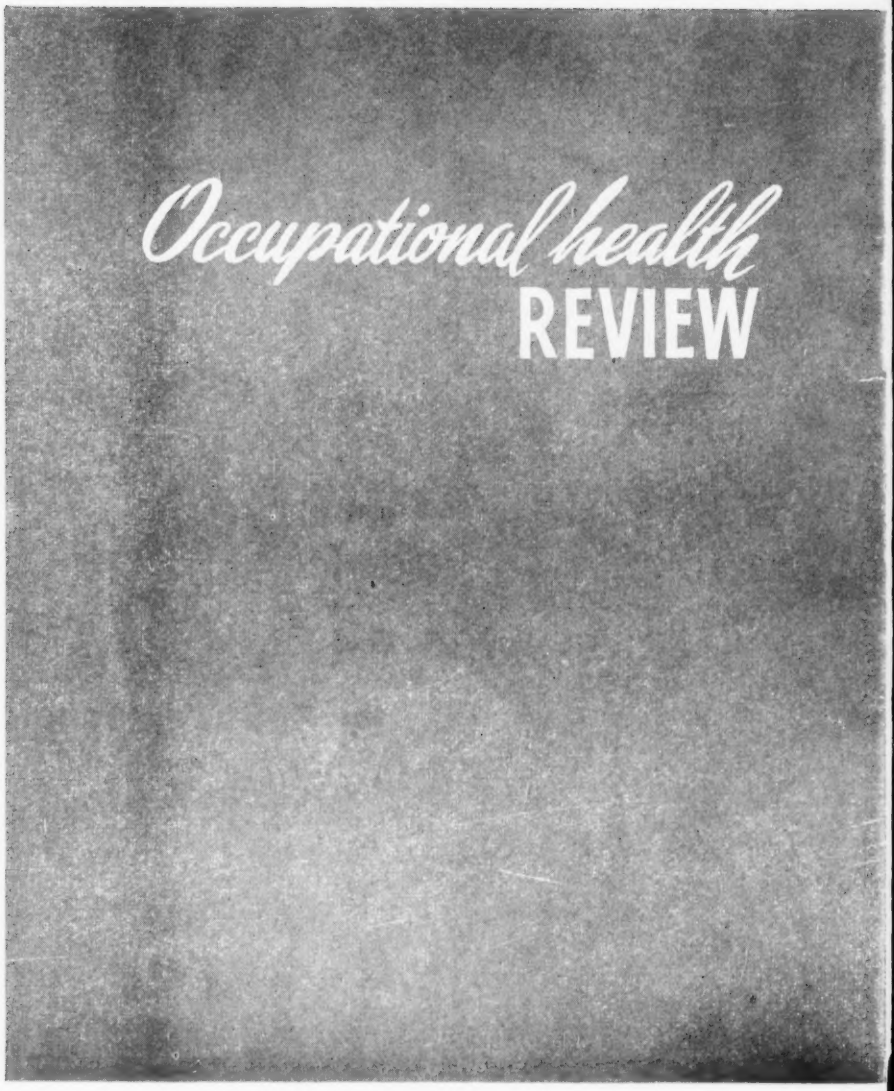
Queen's Printer and Controller of Stationery, Ottawa
1956


Occupational health
REVIEW